

# DOCUMENT RESUME

ED 210 433

CE 030 498

AUTHOR Pretwell, D. H.  
 TITLE Technology Transfer and Vocational Teacher Training in Developing Countries.  
 PUB DATE Dec 81  
 NOTE 11p.; Paper presented at the Annual Convention of the American Vocational Association (Atlanta, GA, December 1981).

EDRS PRICE MF01/PC01 Plus Postage.  
 DESCRIPTORS \*Competency Based Education; \*Competency Based Teacher Education; \*Developing Nations; Economic Climate; Educational Needs; Educational Practices; Educational Trends; \*Individualized Instruction; Needs Assessment; Political Influences; Program Development; Student Teaching; Teacher Education; Teacher Education Programs; Teacher Role; \*Technology Transfer; Vocational Education; \*Vocational Education Teachers

## ABSTRACT

While the vocational instructor can play a major role in assisting the transfer of technology from developed nations, there are some major hurdles involved in training vocational instructors in developing nations. Included among these are the organization of the education system, the political climate of the country, economics, practice teaching, and program development and continuity. While these hurdles may be considerable, the alternative of long-term importation of instructors is usually not economically or politically palatable to developing nations. Therefore, many developing nations are looking to competency-based individualized instruction (CBII) as a method of enhancing vocational training programs and technology transfer. Some benefits of CBII are its flexibility, cost effectiveness, standardized format, objectivity, self-pacing, motivational factors, and direct relevance to job requirements. While there are major problems in implementing CBII, specific approaches do exist to solve these problems. These include translation of CBII terms to standardize language, inservice training, organization of workshops to guide the use of CBII materials, careful initial costing, development of advanced and alternate courses, and use of varied instructional equipment. (MN)

\*\*\*\*\*  
 \* Reproductions supplied by EDRS are the best that can be made \*  
 \* from the original document. \*  
 \*\*\*\*\*

ED210433

TECHNOLOGY TRANSFER AND  
VOCATIONAL TEACHER TRAINING  
IN  
DEVELOPING COUNTRIES

U.S. DEPARTMENT OF EDUCATION  
NATIONAL INSTITUTE OF EDUCATION  
EDUCATIONAL RESOURCES INFORMATION  
CENTER (ERIC)

✓ This document has been reproduced as  
received from the person or organization  
originating it.

□ Minor changes have been made to improve  
reproduction quality.

• Points of view or opinions stated in this docu-  
ment do not necessarily represent official NIE  
position or policy.

"PERMISSION TO REPRODUCE THIS  
MATERIAL HAS BEEN GRANTED BY

by

D. H. Fretwell

TO THE EDUCATIONAL RESOURCES  
INFORMATION CENTER (ERIC)."

Dr. D.H. Fretwell,  
Coordinator  
Instructor Training Institute  
General Organization for Technical Educational and Vocational Training  
Riyadh, Saudi Arabia

Presented to the International Education Subcommittee of the  
American Vocational Association, December 1981

NOTE: The opinions expressed in this paper are those of the author alone, and  
are not endorsed by, or represent, policies of the U.S. Department of Labor or  
the Saudi Arabian General Organization for Technical Education and Vocational  
Training.

CE 030 498

## TECHNOLOGY TRANSFER AND VOCATIONAL TEACHER TRAINING

There is little disagreement between countries and/or individuals relative to the need for a systematic transfer of technology from one group to another. There is however, considerable disagreement about the types of technology that should be transferred and how this transfer should be accomplished. The level and nature of disagreement varies depending on the type of technology being discussed and the philosophies and politics of the individuals, institutions and countries involved.

The transfer of technology between individuals can do much to enhance their personal well being. This can occur as an individual finds an easier and more efficient way to complete his or her job through the use of new technology. The same individual may qualify for an advanced position, with related economic and personal rewards, as his or her information base increases. At another level, the transfer of technology can help both institutions and countries achieve development goals that: increase political stability, reduce the balance of trade deficits and in the long run increase the standard of living for all citizens.

This paper deals with one aspect of how technology transfer between individuals and countries can be enhanced. In particular, the following pages address the important role vocational teacher training can play in technology transfer from developed to developing countries. What contribution do vocational teachers make, what are some of the unique problems encountered in initiating vocational teacher training programs, and can competency based individualized vocational and teacher training programs assist the technology transfer process?

### What contribution can vocational education, and in particular vocational teacher training make to technology transfer?

The integration of a new technology into a developing country can be approached many ways. The physical components of the technology can be simply purchased and delivered (eg. telephones, lathes, etc.). Expatriate technicians can be hired to install and maintain the technology once it is in place. Nationals can be made aware of the need for, and use of, the technology at a consumer level through a variety of media. Nationals can be involved in the selection, installation, maintenance and manufacture of articles necessary to support the technology. Whatever the approach used the most effective, and accepted, long term approach must usually sooner or later involve

training nationals in the actual installation, maintenance, and possible manufacture, of articles necessary to support the technology. Anyone who has spent a considerable amount of time in a developing country knows the futility of sending the physical components of technology without adequate technical support personnel. Similarly, the difficulty of maintaining expatriate technical personnel in a developing country for long periods is also a recognized fact, especially when there are mounting nationalistic sentiments as there are in most countries. Given this perspective the training of national becomes of utmost concern if the technology is to endure in terms of both use and maintenance.

Education, and in particular vocational education, plays a crucial role in the long term. Vocational Education, wherever it is found, has as its primary role the transfer of technology from those who have technical skills and knowledge to those who not have these skills. The Vocational Education environment brings together both the physical aspects of technology with the people who must support the technology. A key component in this environment is the vocational instructor. This is the person who has the skills and knowledge and the responsibility for transferring them to others.

If the instructor is to succeed he must have: (1) the necessary physical support, (2) the requisite technical skills, and (3) the ability to teach others these skills. Given this perspective it is clear that there is a critical need to provide capable vocational instructor training in developing countries. There are many approaches to providing this training including: using expatriate staff, training instructors overseas and, developing an in-country capability to train instructors. Again, the same factors that create pressure to develop an in-country capability to install and maintain technology, will soon surface a need to develop an in-country capability to train vocational instructors.

What are some of the major hurdles that are encountered in developing an in-country capability to train vocational instructors?

While it is hard to generalize there is some commonality, especially in countries that have recently achieved independence, have limited financial resources, and are not highly industrialized. The major problem areas are the organization of the education system, the political climate in the country, economics, practice teaching, and program development and continuity.

● Organization. To place the problems in perspective one must have some understanding of the educational system within a given country and the political climate within which it must operate. In many instances the educational framework within the country, is similar to that found in the colonial power responsible for initial industrial development. Thus in Anglophone Africa we find the British system, and in Francophone Africa the French system. These systems are often highly structured and this structure is carried through into vocational education and vocational teacher training.

In Kenya, a former British colony, the structure and separation of responsibility is exemplified in two areas. First a clear distinction is made between artisan, craft, and technician training.

- an artisan is defined as an individual who takes a government trade test. The individual does not take any organized training, he is responsible for obtaining his own employment, learns the skills himself, and applies to take the test when he feels qualified.
- a craft apprentice is formally apprenticed to an employer through the Directorate of Industrial Training and undergoes a period of organized training and work experience to qualify for the craftsman qualification.
- a technician completes a formal industrial attachment and a training course at a Polytechnic Institute. This person is responsible for installation, maintenance, and repair of equipment under the guidance of a professional engineer.

Second, a number of ministries may be involved in vocational training. In Kenya this includes: Education, Labor, Agriculture, Commerce and Industry, Power and Communications, Housing and Social Services, Finance and Planning, Works, Water Resources, Civil Aviation, Posts and Telecommunications, etc., plus the Office of the President and private industry. These two factors, when combined in a country with a national budget no larger than that of an American city, strain a system that may have difficulty providing one, let alone several types of vocational teacher training programs.

In the area of vocational teacher training, Zambia has five different programs at a new Technical and Vocational Teachers College in Launshaya. The programs include technical, vocational, commercial, industrial arts, instructional aid training, and three different inservice programs. In Kenya, similar programs have been developed at the new Kenya Technical Teachers College, and neighboring Uganda and Tanzania have similar programs. It is difficult to justify the cost of these programs in view of the number of vocational institutions requiring instructors. The possibility of extensive interchange and cooperation between countries may be almost impossible for political reasons.

● Economics. The components and the interactions between them provide the uniqueness in the major role economics plays in teacher training programs in developing countries. Economic factors that merit special mention include scholarship costs, salary costs/levels, effects of outside aid, and provision of facilities and equipment.

First, funds in most developing country families are limited, most teacher trainees attend college on full government scholarships that include room and board. The impact on the ministry involved is great, especially if the program involved is three or four years in length.

A second economic problem may be the wide gap between vocational teacher salaries and industrial salaries. This is not a problem unique to developing countries, but the contrast is often more vivid. In Kenya, for example, an automotive teacher with three to four years of training might earn half of what the same individual may be able to earn in industry as an automobile mechanic. With an extreme shortage of technicians, as in Uganda where many foreigners were expelled several years ago, the result is there are few auto mechanics instructors, and a shortage of auto mechanics. Saudi Arabia experiences a similar vocational instructor supply problem partially due to the same economic factors.

A third problem relates to the overall impact of teachers' salaries on the national budget. At present in many developing countries, only a small portion of the school age population is in school. As the number of schools, and thus teachers, increase more and more pressure is placed on the national budgets. In Kenya, about 60 percent of children attend primary school and one of 10 of these go on to secondary school. Although outside agencies are often willing to build and initially staff additional training facilities, they usually do not like to commit long term funding for recurring staff costs.

Finally, the provision of facilities and equipment for vocational teacher training may not be a great economic problem, given the number of bilateral and multilateral agencies who are often willing and able to provide financial assistance. The major problem may rather be in developing the organizational strategies to use these funds to design, build, and operate the training programs. It is not uncommon to have special funds available in the Ministry of Education that are unused for several years because the knowledgeable people are not available to compile building contracts or order equipment.

Notwithstanding these problems, the economic commitment of many developing countries to education, and vocational/technical education in particular, exceeds that of many developed nations on a percentage basis.

● Practice Teaching. Even such a common activity as practice teaching provides unique challenges in developing nations. Often, the student teacher is "drafted" into full-time work if the host school is short of teachers, a not unusual case. While this has some positive aspects, a lack of supervision and reinforcement in this type of situation is not beneficial to the intern teacher.

Overall supervision of practice teaching is a problem. Communication by mail may be difficult and slow; there may be no telephones and roads may be impassable in wet weather. In Uganda, gasoline and tires are costly and hard to get for school vehicles. In Kenya, during 1976, travel, telephone, and mail services from the Ministry of Education was almost stopped for several months because of budget problems. Evaluation and supervision under these conditions is difficult, if not almost impossible.

Finally, placement of teaching practice students in individual schools has unique aspects: will the student's tribal background contribute to the well-being of the school and will the student be assigned to the school when he completes his training? Where will the student be housed if the school is rural and housing is not available, as is often the case? How will the student get to the school? Is there a bus service? Is the school vehicle operational, and are the roads passable? There are all very real problems and they combine to make the organization and implementation of teaching practice one of the most difficult challenges in vocational teacher education.

● Continuity. Because of the shortage of trained manpower in vocational teacher education, many developing countries are still forced to import expatriates from developed countries on 24 to 30 month contracts. These individuals are succeeded by others who, although equally or adequately qualified, may or may not have the same ideology, concepts, techniques, etc., as their predecessors. For example, in Kenya in the past 10 years, the head of technical education in the Ministry of Education has been successively from: Britain, Australia, and Canada (twice). In Saudi Arabia at present, German advisers work with the Technical Schools and American advisers with Vocational Schools, both within the same General Organization. Continuity may, as a result, suffer. This problem may not be easy to solve because:

- recruitment from overseas cannot be avoided until the developing country is self-sufficient,
- when a donor country is offering technical assistance, there is a natural tendency for the foreign technicians to mold the project according to their own backgrounds,

- there can be an effect on continuity through conditions agreed upon with the donor country, such as import content and technical assistance requirements, (for example, building plans may be heavily influenced by donor country architects and large portions of grant equipment may be required to be purchased from the donor.) These elements remain long after donor country personnel have left and other foreign personnel have arrived with new and different ideas.

The general effects of this lack of continuity on students, program, and curriculum is often confusion and loss of time in solving the problems of vocational teacher training. However, while this is not the most beneficial condition, most foreigners and nationals would agree that disjointed outside help is better than none at all if a systematic transfer of technology is to occur.

#### Can Competency Based Individualized Vocational and Teacher Training Programs Assist the Technology Transfer Process?

The emergence of Competency Based Individualized Instruction (CBII), at both the vocational school and vocational teacher training levels, during the past decade in the United States and other countries, has made considerable impact on the delivery of vocational education. Some developing countries are looking at CBII as a methodology to help assimilate technology more efficiently. The implementation of CBII has been accomplished with varied degrees of success and enthusiasm throughout the world. There are also many varied definitions as to what really constitutes CBII. The term "competency based" usually indicates that instructional content is determined by the tasks required to complete a specific job. For some CBII is simply "programmed instruction" in a primarily printed format, while for others it encompasses a multitude of instructional media that the instructor "manages." The term "individualized" itself may be interpreted to mean individualized pacing for trainees, or individualized methods of instructional delivery or individualized pacing and delivery.

● Why CBII? Some of the often identified, and sometimes disputed, contrasts between the traditional instruction and CBII are listed below in order to clarify why CBII may appear to be very useful to emerging industrial nations who are trying to assimilate technology quickly and efficiently.

- CBII allows for open entry/exit program operation with the resultant saving in time,
- CBII is more cost effective,
- CBII allows advanced placement based on testing,
- CBII is standardized and "instructor proof,"

- CBII allows for varied learning styles and needs through the use of different media,
- CBII increases objectivity of evaluation,
- CBII motivates students better than traditional instruction,
- CBII is self paced,
- CBII sets instructional objectives directly related to job requirements.

● Challenges in implementing CBII. Some of the specific hurdles that must be overcome in implementing CBII in a developing country include:

- translation problems, some basic terms such as "competency" as well as technical terms may not be directly translatable in the foreign language,
- inservice training, large number of traditional instructors who are to work with CBII trained personnel and materials, must be retrained. They may not be available for orientation and training due to economic, geographic and political complications,
- workshop organization and supply of consumables, ordering may be done only once a year and direct substitution of materials and equipment may be normal due to shortages or local purchase procedures,
- instructional procedures that are very traditional with respect to scheduling, evaluation and delivery of training,
- political subdivisions may force small geographical/economic units to each develop their own instructional materials at a very high cost,
- an aversion to the evaluation and testing that is inherent in CBII,
- major physical problems with use of mediated materials (no power, varied voltages, dirty conditions) combined with very low reading level of trainees that make use of printed materials impractical,
- conflicts between accelerated completion of vocational courses and high unemployment levels,
- high initial costs of developing materials and difficulty in updating them,
- presence of a wide variety of instructional equipment, non standardized, from many countries due to previous bilateral and multilateral aid programs,
- very weak maintenance programs resulting in equipment being inoperable for long periods of time,
- lack of consensus within the education community as to what CBII is and should be.

● How to meet the challenges. Some of the specific approaches that can be used to solve the implementation problems previously cited include:

- translation, the CBII developer may have to develop and standardize language with reference to CBII terms and within particular trades through development of glossaries and illustrated vocational dictionaries,
- inservice training, the CBII developer will have to develop an extensive program to ensure traditional instructors are orientated to work with CBII trained instructors,
- workshop organization and supply, the CBII developer may have to develop detailed shop organization and provisioning guides to go with CBII curriculum materials,
- traditional procedures, the CBII developer may be forced to start implementation using traditional scheduling and evaluation procedures then, slowly implement charges,
- political subdivisions, the CBII developer may have to emphasize careful adaptation techniques as opposed to adoption of already developed materials,
- testing and evaluation, these programs may have to be trainee directed, not group or instructor oriented,
- physical problems with mediated materials, these problems may dictate the development of special use rooms in workshops and may eliminate use of sophisticated equipment (i.e. computer assisted instructor). Printed materials may have to be put on audio tapes to compensate for reading problems,
- high unemployment levels may force development of advanced or alternate courses to help keep students off the job market,
- high costs of full CBII development may cause the entire program to terminate before full implementation if initial costing is not carefully done and agreed upon,
- varied instructional equipment, the CBII developer must concentrate on writing generic instruction because of different types of equipment,
- the educational community will need continual, systematic, and standardized orientation to CBII.

In summary, the vocational instructor can play a major role in assisting the transfer of technology from developed to developing countries. His role is that of a human linkage between the technology itself and the individuals that lack, but desire to obtain, the necessary skills to use, install and maintain the technology in question. The problems involved in creating an in-country capacity to train instructors are considerable, however the alternative of long-term importation of instructors is usually not economically or politically palatable to developing nations. Most developing countries recognize these factors and make early moves to develop in-country instructor training capabilities to help ensure independence. In addition, where sufficient resources and commitment can be identified, Competency Based Individualized Instruction is being looked to as a method of further enhancing vocational training programs and the efficient transfer of technology.